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EXECUTIVE SUMMARY

A STATEWIDE SURVEY OF LEAD IN SCHOOL DRINKING WATER

An Estimate of the Prevalence of Elevated Lead Levels in Drinking Water and Recommendations for Remedial Action to Reduce Exposure to Lead

September 8, 1988

State Laboratory Institute and the
Childhood Lead Poisoning Prevention Program
Massachusetts Department of Public Health
305 South Street, Jamaica Plain, MA 02130

584/30

STATEWIDE SURVEY OF LEAD IN THE DRINKING WATER OF PUBLIC SCHOOLS

State Laboratory Institute
Massachusetts Department of Public Health

August 30, 1988

DRINKING FOUNTAINS (Tables 1A, 1B)

Table 1A. FIRST FLUSH. Measurement of lead in water at drinking fountains. Number (and percentage) of samples in three categories of lead concentration expressed in micrograms of lead per liter of water. Data represented by region and for all samples statewide (NE: Northeast; SE: Southeast; C: Central, W: Western; ALL: Statewide).

LEAD CONC. (micrograms per liter)	NE	SE	C	W	ALL
50 or higher	7/31 (23%)	3/17 (18%)	3/12 (25%)	2/10 (20%)	15/70 (21%)
20 to 49	7/31 (23%)	3/17 (18%)	4/12 (33%)	1/10 (10%)	15/70 (21%)
less than 20	17/31 (55%)	11/17 (65%)	5/12 (42%)	7/10 (70%)	40/70 (57%)

Table 1B. TWO MINUTE FLUSH. Measurement of lead in drinking water at drinking fountains following a free-flow of water for two minutes after the first flush.

LEAD CONC. (micrograms per liter)	NE	SE	C	W	ALL
50 or higher	0/31 (0%)	0/17 (0%)	1/12 (8%)	1/10 (10%)	2/70 (3%)
20 to 49	4/31 (13%)	1/17 (6%)	2/12 (17%)	2/10 (20%)	9/70 (13%)
less than 20	27/31 (87%)	16/17 (94%)	9/12 (75%)	7/10 (70%)	59/70 (84%)

Drinking fountains	31	17	12	10	70
Number of schools	20	8	6	5	39

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LEAD IN DRINKING WATER IN PUBLIC SCHOOLS

INTRODUCTION

A survey of lead in the drinking water of public schools in Massachusetts was conducted to estimate the prevalence of elevated levels of lead in drinking water. For the purpose of this study, elevated levels of lead were defined at two concentrations, i.e. at 50 micrograms or more of lead per liter (ug/L) of water, the current U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL), and at 20 ug/L or more, an MCL for lead which was proposed by EPA at the time of the study design. Four hundred sixty-two samples were collected from 39 public schools and analyzed for lead concentration. An additional thirty-nine samples were collected to measure pH.

In 1986, a study done for EPA by the Culligan Company and the Illinois Institute of Technology examined 772 grab samples taken at random times and collected in 580 cities in 47 states. This EPA study indicated that 16% of the water from U.S. kitchen taps contained 20 ug/L or more of lead. In their report on The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress, July 11, 1988, the U.S. Agency for Toxic Substances and Disease Registry stated that a significant omission in the national estimate of lead exposure to children is the lack of data on prevalence of high lead levels in drinking water in schools. The Massachusetts study of lead in drinking water of public schools provides a reliable estimate of the prevalence of high lead levels in drinking water in schools, and provides a basis for estimation of lead exposure from drinking water in schools.

OBJECTIVES OF THE STUDY

This was a descriptive study designed with three objectives: (1) to estimate the proportion of elementary schools that have lead levels in drinking water at 50 micrograms or more per Liter (µg/L) and 20 µg/L or more "at the tap", (2) to estimate the concentration of lead in water supplied to schools from public water supplies (PWS) and (3) to estimate the effect of flushing water systems on the concentration of lead in drinking water.

SAMPLE DESIGN

Sampling Plan. The goal was to test water from 40 Massachusetts public schools selected from all schools that had one or more grades K thru 6, 25 or more students, and received drinking water from Public Water Supplies. All public schools with these characteristics and which were listed in the sample list constituted the sampling frame.

A random systematic sample was taken within the four Department of Environmental Quality Engineering (DEQE) regional areas, i.e. Northeast (NE), Southeast (SE), Central (C) and Western (W). Fifty schools in total were selected from the four regions, weighted by population, to allow for loss of randomly selected schools that might not be able to participate in the survey.

The sample list used was "Massachusetts Schools, 1986-1987", Massachusetts Department of Education. After sorting the list and extracting those schools that had one or more grades K-6 and 25 or more students, 1,361 schools were eligible for inclusion in the study.

Flowchart for Stratified Random Sample

Public Schools
One or more grades K-6
25 or more students

Stratified by Four
DEQE Regional Areas

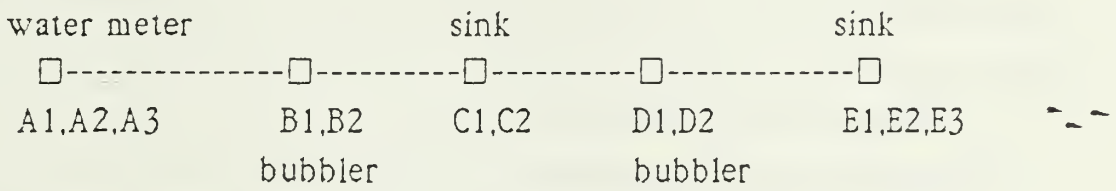
50 Schools selected from NE, SE, C, N
Weighted by population

Northeast-24 Southeast-10 Central-8 Western-8

Goal 40 schools in final study sample
Northeast=20 Southeast=8 Central=6 Western=6

12 samples per school for lead = 480 samples
1 sample per school for pH = 40 samples

Water Samples. At each school, 12 water samples were taken for lead concentration and one sample for pH measurement. Samples were collected by laboratory staff of the State Laboratory Institute. The sampling protocol is described in detail in Appendix A which is included in the final report. Sampling sites were chosen according to a predetermined schedule outlined here.



- Three (3) samples for lead concentration were taken at the tap nearest the WATER METER , and labeled as sample A1, the first flush sample; A2, the sample taken after a temperature change was noticed in water flowing freely from the tap and sample A3, the sample taken five minutes after opening the tap. A fourth sample was taken for pH determination immediately after the A3 sample.
- Four samples were taken at WATER BUBBLERS OR COOLERS. Two, 250 ml samples were taken at the water bubbler or cooler closest to the water meter and labeled B1,B2. The first flush samples were labeled B1 and the samples taken after allowing the water to flow for two minutes were labeled B2. Two other samples were taken at a water bubbler or cooler at a point close to the midpoint of the water system and labeled D1 and D2, a first flush sample and a two minute flush sample respectively.
- Five, one liter samples were taken at SINKS. Two samples (C1,2) were taken at sinks located in the water system between the sampling sites used for the B1/B2 and D1/D2 sampling points. A final set of three samples was taken from the sink at the most distant point from the water meter. These final samples were taken at first flush, E1, after a 2 minute flush, E2, and after 10 minutes of flushing, E3.

Laboratory Analysis

Detection and quantitation of lead was done at the State Laboratory Institute by graphite furnace Atomic Absorption Spectroscopy according to the Methods for Chemical Analysis of Water and Wastes, Method 239.2, EPA 600/4-79-020, U.S. Environmental Protection Agency (1979). Samples that exceeded 75 ug/L by the standard EPA method were analyzed by Delve's Cup Method. Analytical protocols are aincluded as Appendices B and C in the final report. Test results reported are the average of duplicate assays of each sample and are expressed as micrograms of lead per liter of water (equivalent to parts per billion). Quality control limits for known reference standards were established prior to analysis of survey samples, and quality control / quality assurance procedures included in all test runs were calibration curves, internal controls, external controls and independent monitoring of test results. Lead concentrations in samples were not quantitated below 5 ug/L, the lowest concentration included in the calibration curves.

RESULTS

Of the randomly sampled schools, 39 schools were able to participate in the survey. The towns represented in the survey are listed here by DEQE Region.

Northeast (n=20)

Brighton	Lowell
Cambridge	Malden (2)
Dorchester (2)	Marblehead
Framingham	Natick
Gloucester	Newton (2)
Haverhill	Newbury
Lawrence	Quincy
Lincoln	Reading (2)

Southeast (n=8)

Berkley	New Bedford
Brockton	Oak Bluffs
Fall River	Stoughton
Franklin	West Yarmouth

Central (n-6)

Gardner (2)	Townscend
Holliston	Worcester
Marlborough	

Western (n-5)

Hadley	Palmer
Ludlow	West Springfield (2)

Thirty-nine schools were sampled in the testing program. The distribution of schools tested according to DEQE Region was Northeast, 20, Southeast, 8, Central, 6 and Western, 5.

The results for all samples from each school are shown in List A that is included in the final report. Summary data are presented in several tables and graphs described here.

Tables 1 A,B and 2 A,B show the proportion of bubblers or coolers (Table 1) and sinks or other water taps (Table 2) that exceeded either 50 ug/L or 20 ug/L at first flush and after a 2 minute flush. These tables are adjusted for discrepant samplings where either a B or D sampling was not taken at a cooler or bubbler, or a D or E sample was not taken at a sink or other tap. In all 70 bubblers or coolers , and 120 sinks or other taps were sampled.

As shown in Table 1A, 15/70 (21%) drinking fountains had lead in water levels of 50 ug/L or greater at first flush, and 15/70 (21%) had levels between 20 and 49 ug/L. In Table 1B, data show that after a 2 minute flush, 2/70 (3%) drinking fountains had lead levels of 50 ug/L or greater and 9/70 (13%) had lead levels from 20 to 49 ug/L.

Table 2A shows that at sinks and other faucets, 38/120 (32%) of these sites had first flush water samples with lead levels that exceeded 50 ug/L, and 25/120 (21%) had lead levels from 20 to 49 ug/L. Table 2B shows the test results for the two minute flush samples from these sites where 3/120 (3%) had lead levels of 50 ug/L or more and 10/120 (8%) had lead levels between 20 and 49 ug/L.

Graph 1 describes the test results of samples from the tap nearest the WATER METER, the "A" series of samples. Graphs 1A and 1B describe the mean and median lead levels, respectively, for each of the four regions, and an overall mean and median. As seen in Graph 1A, the overall mean for the

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DRINKING FOUNTAINS (Tables 1A, 1B)

Table 1A. FIRST FLUSH. Measurement of lead in water at drinking fountains. Number (and percentage) of samples in three categories of lead concentration expressed in micrograms of lead per liter of water. Data represented by region and for all samples statewide (NE: Northeast; SE: Southeast; C: Central, W: Western; ALL: Statewide).

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50 or higher	7/31 (23%)	3/17 (18%)	3/12 (25%)	2/10 (20%)	15/70 (21%)
20 to 49	7/31 (23%)	3/17 (18%)	4/12 (33%)	1/10 (10%)	15/70 (21%)
less than 20	17/31 (55%)	11/17 (65%)	5/12 (42%)	7/10 (70%)	40/70 (57%)

Table 1B. TWO MINUTE FLUSH. Measurement of lead in drinking water at drinking fountains following a free-flow of water for two minutes after the first flush.

LEAD CONC. (micrograms per liter)	NE	SE	C	W	ALL
50 or higher	0/31 (0%)	0/17 (0%)	1/12 (8%)	1/10 (10%)	2/70 (3%)
20 to 49	4/31 (13%)	1/17 (6%)	2/12 (17%)	2/10 (20%)	9/70 (13%)
less than 20	27/31 (87%)	16/17 (94%)	9/12 (75%)	7/10 (70%)	59/70 (84%)

Drinking fountains	31	17	12	10	70
Number of schools	20	8	6	5	39

SINKS AND FAUCETS (Tables 2A, 2B)

Table 2A. FIRST FLUSH. Measurement of lead in water from sinks and faucets. Number (and percentage) of samples in three categories of lead concentration expressed in micrograms of lead per liter of water. Data represented by region and for all samples statewide (NE: Northeast; SE: Southeast; C: Central, W: Western; ALL: Statewide).

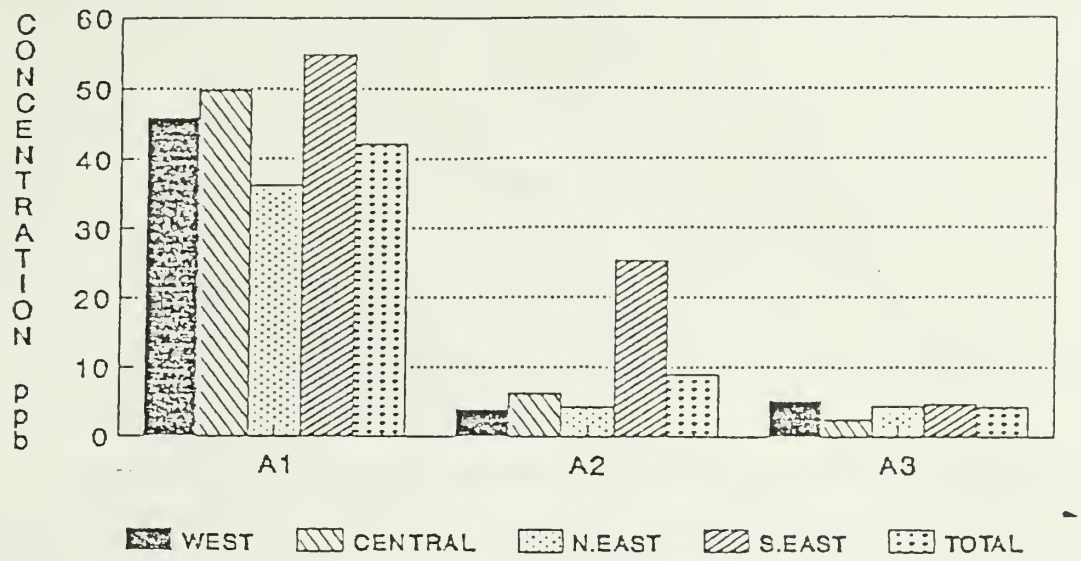
LEAD CONC. (micrograms per liter)	NE	SE	C	W	ALL
50 or higher	21/64 (33%)	5/23 (22%)	7/18 (39%)	5/15 (33%)	38/120 (32%)
20 to 49	14/64 (22%)	4/23 (18%)	4/18 (22%)	3/15 (20%)	25/120 (21%)
less than 20	29/64 (45%)	14/23 (61%)	7/18 (39%)	7/15 (47%)	57/120 (48%)

Table 2B. TWO MINUTE FLUSH. Measurement of lead in drinking water at sinks and faucets following a free-flow of water for two minutes after the first flush.

LEAD CONC. (micrograms per liter)	NE	SE	C	W	ALL
50 or higher	0/64 (0%)	2/23 (9%)	1/18 (6%)	0/15 (0%)	3/120 (3%)
20 to 49	8/64 (13%)	0/23 (0%)	1/18 (6%)	1/15 (7%)	10/120 (8%)
less than 20	56/64 (88%)	21/23 (91%)	16/18 (89%)	14/15 (93%)	107/120 (89%)
Sinks and Faucets	64	23	18	15	120
Number of schools	20	8	6	5	39

GRAPH 1A

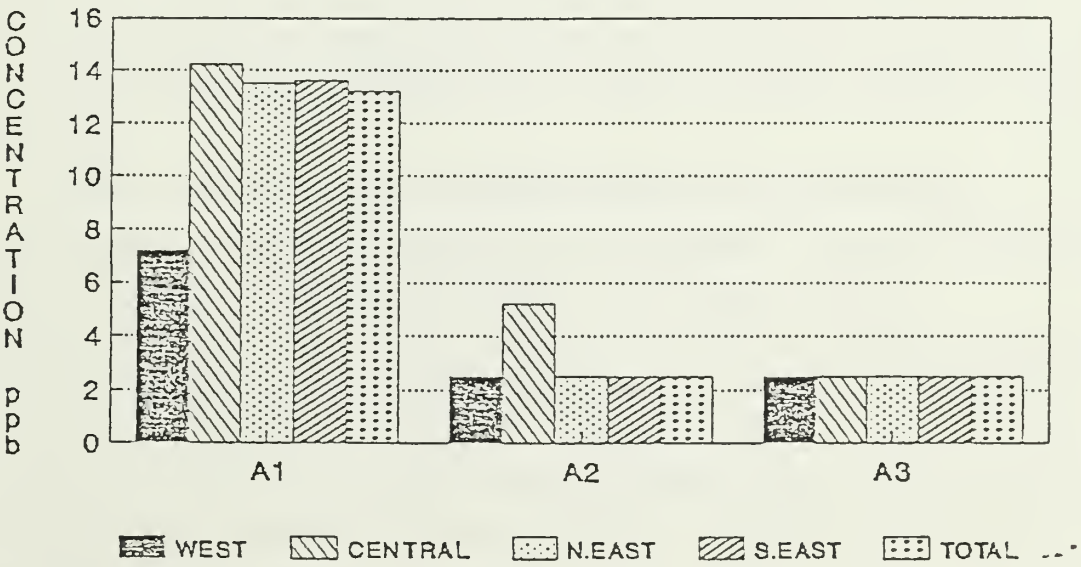
MEAN LEAD LEVELS
TAP CLOSEST TO WATER METER



A1-First flush
A2-Sampled after temperature change
A3-Sampled after five minutes

GRAPH 1B

MEDIAN LEAD LEVELS
TAP CLOSEST TO WATER METER



A1-First flush
A2-Sampled after temperature change
A3-Sampled after five minutes

first flush samples (A1) is over 40 micrograms of lead per liter (40 ug/L) of water. This level decreases to less than 10 ug/L after flushing until a temperature change is noticed (A2) and to less than 5 ug/L after flushing for 5 minutes (A3). The regional means do not vary remarkably except for the Southeast "A2" mean that remained above 20 ug/L. The elevated mean level for the Southeast Region is due to a single elevated value of 107.5 ug/L. The data in Graph 1B show the overall median for the first flush "A1" samples is approximately 13 ug/L. The median decreases to less than 5 ug/L (the limit of quantitation for the analytical assay) after flushing as seen in the results for the A2 and A3 samples.

Graphs 2A and 2B show the mean and median summary statistics for test results of lead levels for water samples taken from the BUBBLER OR COOLER CLOSEST TO THE WATER METER. The overall mean lead level shown in Graph 2A at first flush for these samples ("B1" samples) is greater than 100 ug/L, and decreases to less than 10 ug/L after 2 minutes flushing. As indicated in Graph 2B, the median lead level for these B samples is almost 20 ug/L at first flush and decreases to less than 5 ug/L after two minutes of flushing.

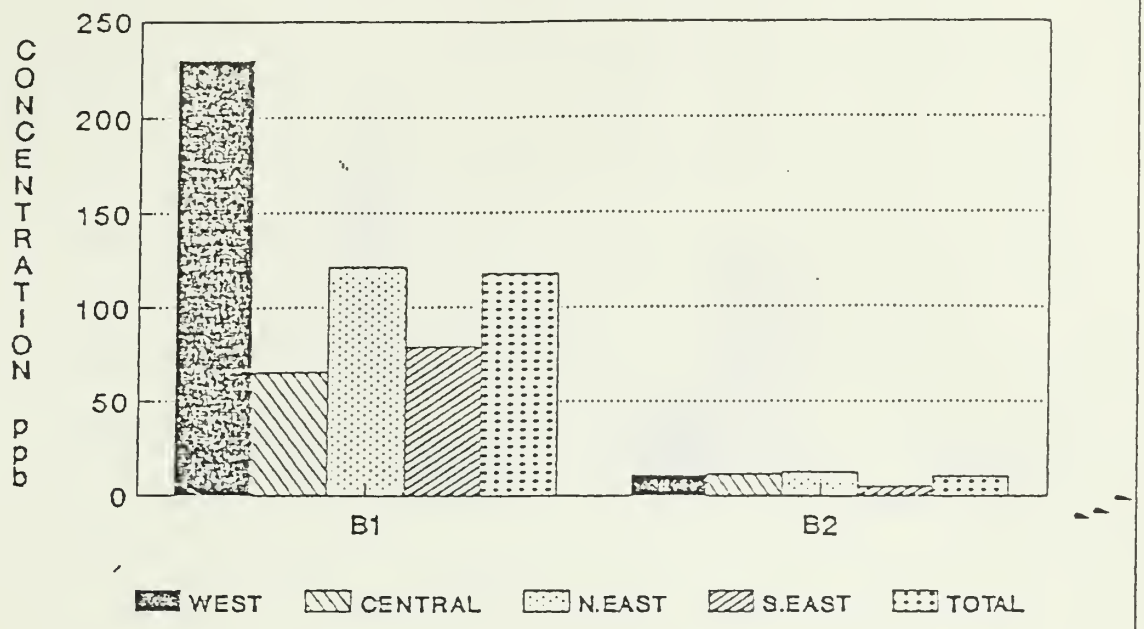
Graphs 3A and 3B depict the test results for samples taken at a BUBBLER OR COOLER NEAR THE BUILDING MIDPOINT, the "D" series of samples. The overall mean and median levels are approximately 60 ug/L and 20 ug/L for the "D" samples at first flush. Following a two minute flush, the overall mean lead level was 20 ug/L while the median lead level is less than 5 ug/L.

Graphs 4A,B show only the overall mean and median summary statistics before and after flushing for the taps closest to the water meters in schools at the three sampling intervals: A1, first flush; A2,after a temperature change; and A3, after 5 minutes of flushing. These tables more clearly display the average effects of flushing on lead levels. The average lead level of 43.3 ug/L at first flush is reduced by 79% to a level of 8.9 ug lead/L after flushing until there is a temperature change in the water. After flushing for 5 minutes, the lead concentration is 4.3 ug/L, a 90% reduction in lead level from first flush.

Graphs 5A,B show only the overall mean and median summary statistics before and after flushing at drinking fountains, i.e. both bubblers and coolers. The mean lead level of 63 ug/L at first flush is reduced by 68%

GRAPH 2A.

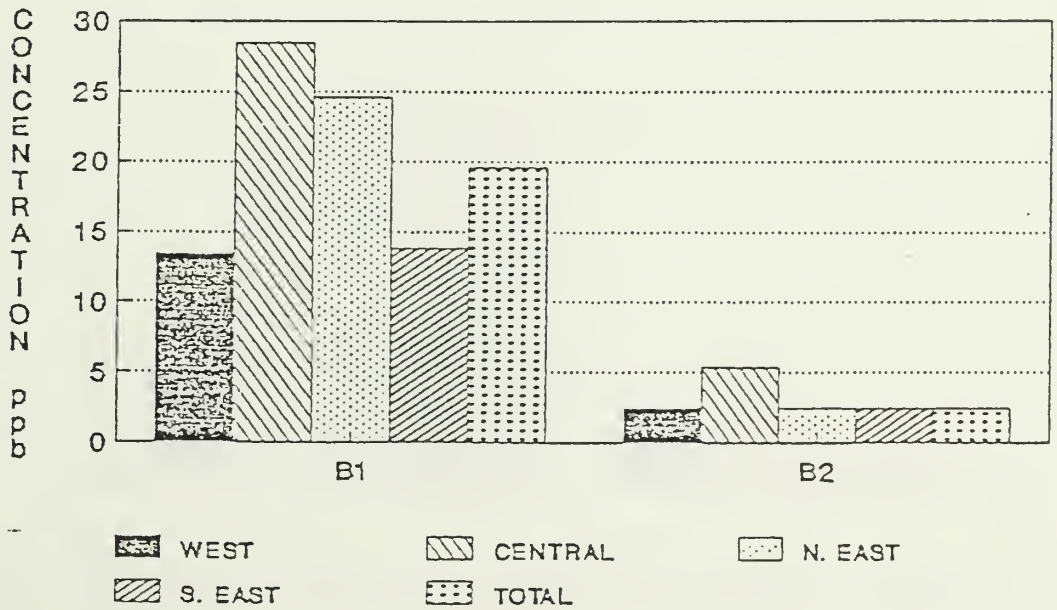
MEAN LEAD LEVELS
WATER FOUNTAIN CLOSEST TO WATER METER



B1-First flush
B2-Sampled after two minutes

GRAPH 2B.

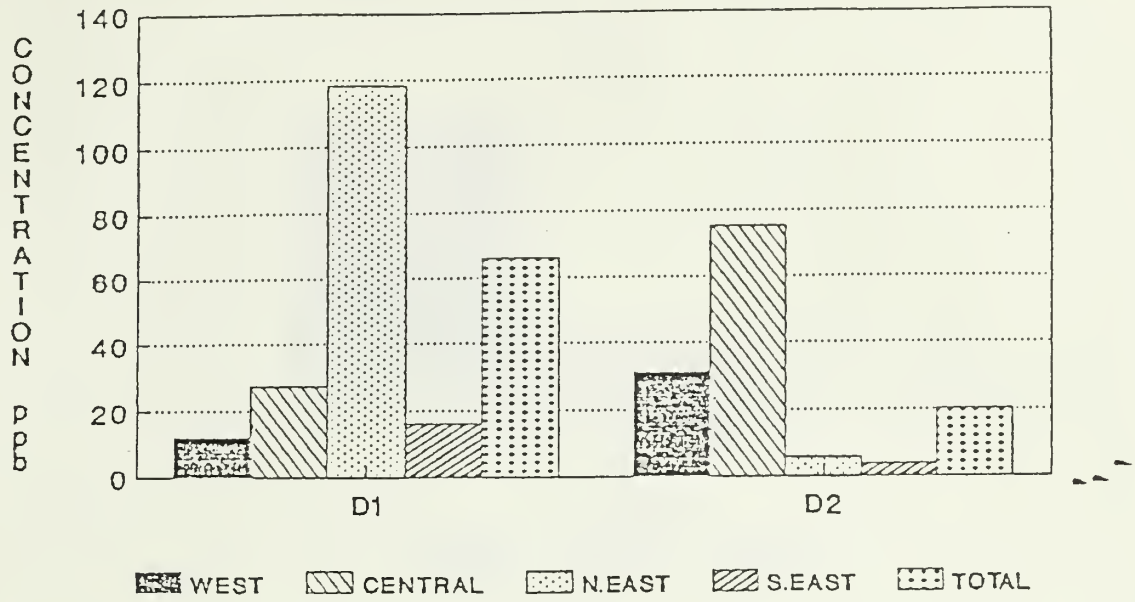
MEDIAN LEAD LEVELS
WATER FOUNTAIN CLOSEST TO WATER METER



B1-First flush
B2-Sampled after two minutes

GRAPH 3A.

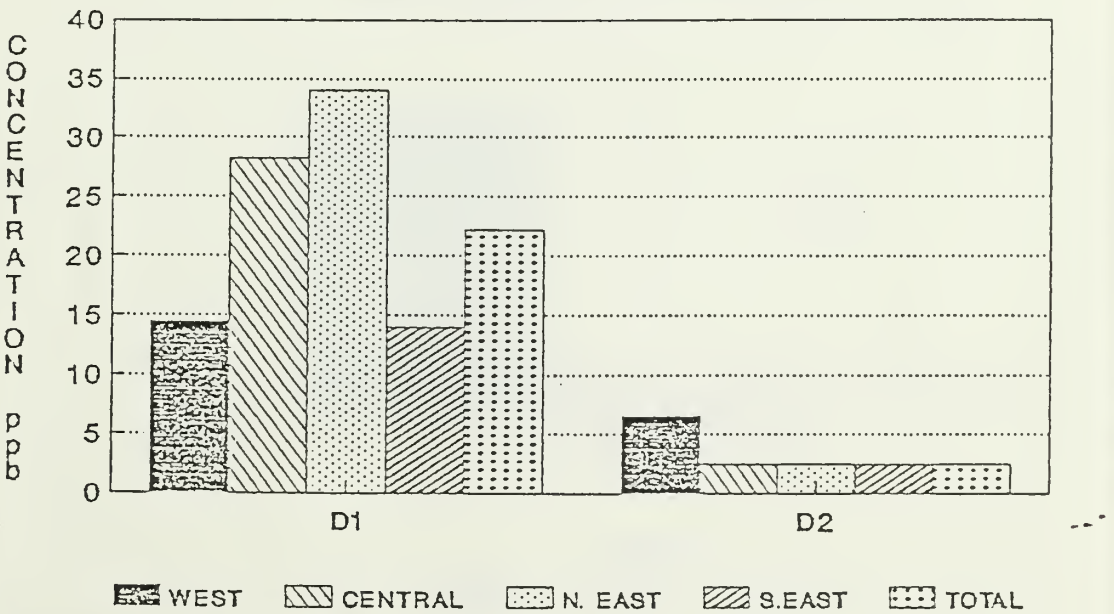
MEAN LEAD LEVELS
WATER FOUNTAIN AT BUILDING MIDPOINT



D1-First flush
D2-Sampled after two minutes

GRAPH 3B.

MEDIAN LEAD LEVELS
WATER FOUNTAIN AT BUILDING MIDPOINT



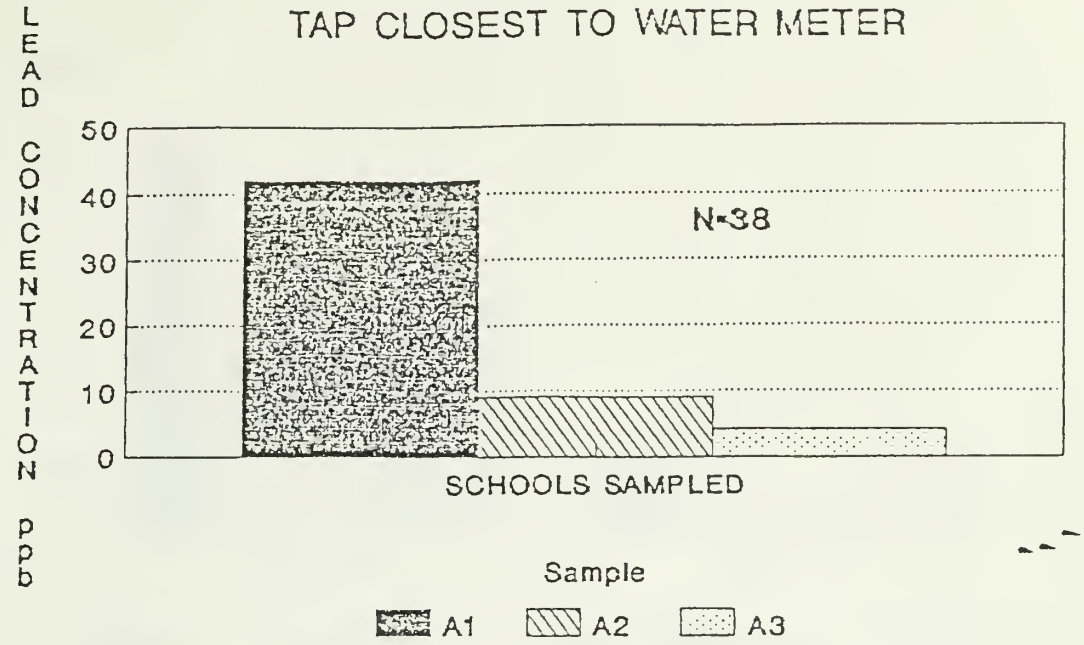
D1-First flush
D2-Sampled after two minutes

GRAPH 4A

EFFECTS OF FLUSHING

MEAN LEAD LEVELS

TAP CLOSEST TO WATER METER



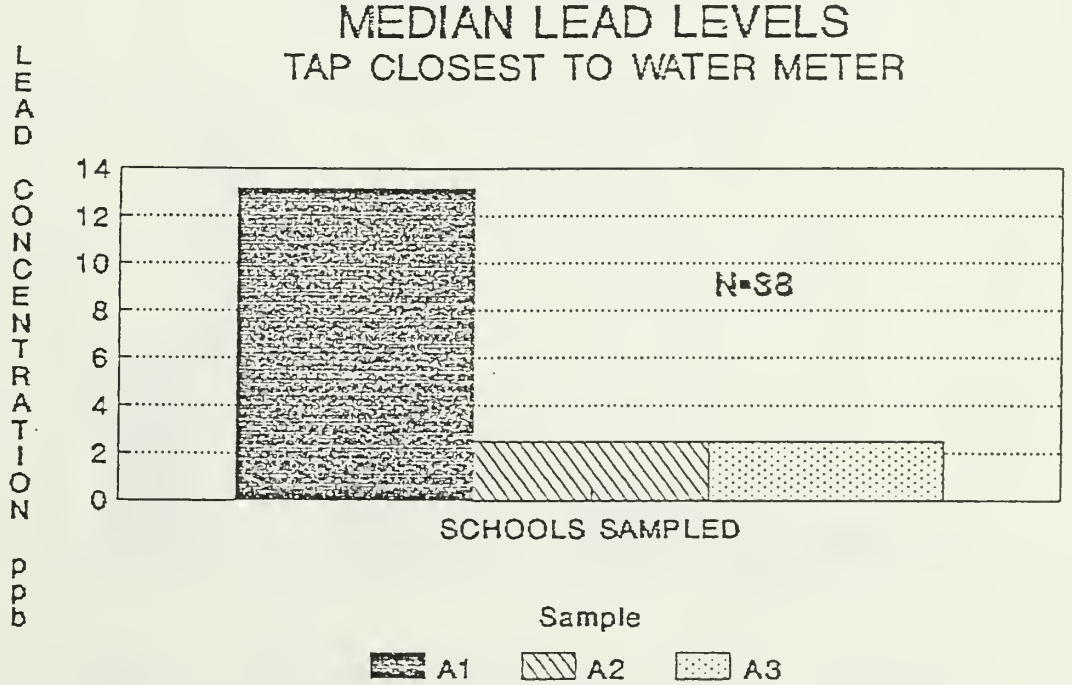
A1-First flush
A2-Sampled after temperature change
A3-Sampled after five minutes

GRAPH 4B

EFFECTS OF FLUSHING

MEDIAN LEAD LEVELS

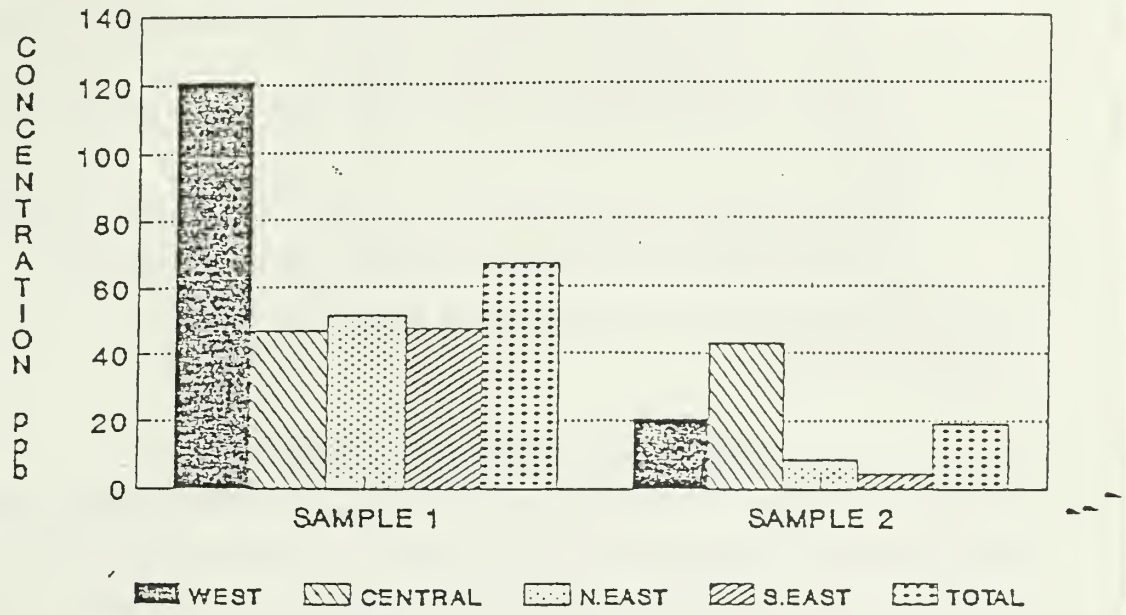
TAP CLOSEST TO WATER METER



A1-First flush
A2-Sampled after temperature change
A3-Sampled after five minutes

GRAPH 5A.

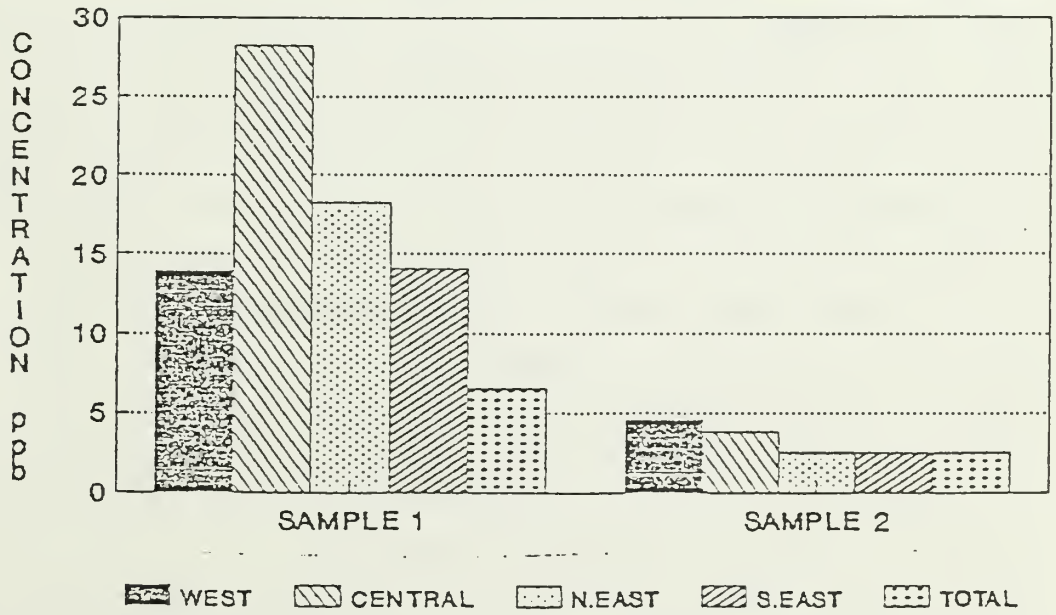
MEAN LEAD LEVELS
BUBBLERS & COOLERS



SAMPLE 1-First flush
SAMPLE 2-Sampled after two minutes

GRAPH 5B.

MEDIAN LEAD LEVELS
BUBBLERS & COOLERS



SAMPLE 1-First flush
SAMPLE 2-Sample after two minutes

supplier". The mean and median levels for these samples were below 10 ug/L for these samples (means 9.5 ug/L and less than 5 ug/L, and medians less than 5 ug/L for both samples, respectively).

The third objective was to measure the effect of flushing on lead levels in drinking water. As shown in Graphs 3 A,B, lead levels in water can be reduced significantly by flushing. The average reduction in the concentration of lead in water achieved by short periods of flushing is 71% and the median concentration of lead in bubblers after flushing for 2 minutes is less than 5 ug/L. This study defines the extent of lead contamination in drinking water within schools and suggests possible solutions with regard to reducing lead contamination in drinking water. Although the major sources of lead that leaches into drinking water are pipes, joints and fixtures within buildings, reduction of corrosivity of water should be included in short and long range options as an efficient means of reducing the concentration of lead in water.

RECOMMENDATIONS

The data in this survey provide a basis for applying recommendations of EPA and the Massachusetts Department of Quality Engineering with regard to management of lead in school drinking water. This report provides interim recommendations that can be implemented immediately by all schools to reduce exposure to lead from drinking water. School Superintendents should contact their local health agents and local water supplier for assistance. The Massachusetts Department of Public Health will provide additional advice and guidance as needed.

Surveyed Schools

Those schools that had lead levels below 20 ug/L:

- Use of bubblers, faucets and sinks may continue as usual.
- Only cold water taps should be used for cooking, beverages and food preparation.
- Develop a plumbing profile of your schools (detailed information will be mailed out by the Department of Education).
- Further testing may be necessary depending on the findings from the plumbing profile.

Those schools that had one or more samples above 20 ug/L:

- Flush water bubblers and coolers, and sinks used for food preparation each morning for 2 minutes. A more detailed flushing protocol that is recommended by EPA will be sent to all schools.
- Take out of service any bubbler, cooler, or sink that had levels that did not fall below 20 ug/L after flushing as indicated in the survey. Other bubblers, sinks, and coolers may be used.
- Coolers and bubblers that had lead levels above 100 ug/L at first flush should be taken out of service, even if the lead levels are reduced below 20 ug/L after one flushing.
- Only cold water taps should be used for food preparation.
- Develop a plumbing profile of the schoo.
- Conduct further testing if indicated by the plumbing profile.

Schools Not Surveyed

Schools that were not surveyed should adopt the following interim measures until they can complete a plumbing survey and have testing done for lead in water.

- Begin now to flush for two minutes at bubblers, ccolers and sinks each morning. Follow EPA flushing protocol that will be sent to each school district within the next two weeks.
- Use cold water taps for all food preparation.
- Develop a plumbing profile.
- Test water at a minimum number of sites as in the statewide survey, and at other sites as indicated by the pliumbing profile.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST

STATEWIDE SURVEY OF LEAD IN WATER IN MASSACHUSETTS PUBLIC SCHOOLS

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
STATE LABORATORY INSTITUTE

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
1	23995	A1	SINK	HADLEY	RUSSELL	<5	
1	23996	A2	SINK	HADLEY	RUSSELL	<5	
1	23997	A3	SINK	HADLEY	RUSSELL	<5	
1	23999	B1	BUBBLER	HADLEY	RUSSELL	8.8	
1	24000	B2	BUBBLER	HADLEY	RUSSELL	<5	
1	24001	C1	SINK	HADLEY	RUSSELL	<5	
1	24002	C2	SINK	HADLEY	RUSSELL	<5	
1	24003	D1	BUBBLER	HADLEY	RUSSELL	5.9	
1	24004	D2	BUBBLER	HADLEY	RUSSELL	<5	
1	24005	E1	SINK	HADLEY	RUSSELL	<5	
1	24006	E2	SINK	HADLEY	RUSSELL	<5	
1	24007	E3	SINK	HADLEY	RUSSELL	<5	
1	24034	A1	SINK	LUDLOW	CHAPIN	20.0	
1	24035	A2	SINK	LUDLOW	CHAPIN	9.5	
1	24036	A3	SINK	LUDLOW	CHAPIN	13.1	
1	24038	B1	BUBBLER	LUDLOW	CHAPIN	7.7	
1	24039	B2	BUBBLER	LUDLOW	CHAPIN	<5	
1	24040	C1	SINK	LUDLOW	CHAPIN	24.9	
1	24041	C2	SINK	LUDLOW	CHAPIN	9.8	
1	24042	D1	BUBBLER	LUDLOW	CHAPIN	23.5	

to 19.9 ug/L after 2 minutes flushing at drinking fountains. The median level of 6 ug lead/L is reduced to less than 5 ug/L of lead.

Results of pH measurements that were done on samples taken at the water meters after flushing indicated the range of pH was from 4.77 to 9.64. The mean (average) pH for all samples was 7.31, and the mean pH by Regions was 7.83, Northeast; 7.05, Southeast; 7.02, Central and 7.35, West.

DISCUSSION

The results of this study are consistent with other studies of lead in drinking water "at the tap". Although lead is rarely found in public drinking water sources at significant levels, lead can contaminate drinking water as it moves through the distribution system to buildings, and as it moves through plumbing within buildings. Specific sources of this lead contamination are lead pipes, service connection lines and goosenecks, brass and bronze fixtures, lead-based solder in copper plumbing and lead-lined piping and storage tanks in electrically- cooled water coolers. A major factor which influences the amount of lead contamination is the quality of the water supply with regard to the corrosivity (lead-dissolving capacity).

The three objectives of this study were met and are discussed here. Test results and data analysis indicate the potential for lead exposure in public schools, and provide a basis for risk assessment.

The first objective was to estimate the prevalence of elevated levels of lead in drinking water in schools. Water taken at first flush from drinking fountains exceeded 20 ug/L at 30/70 or forty-two percent (42%) of the drinking fountains in schools. 15/70 or twenty-one percent (21%) of these water samples exceeded 50 ug/L. A two minute flushing reduced this prevalence to 11/70 or16% of the drinking fountains exceeding 20 ug/L and 2/70 or 3% exceeding 50ug/L. Comparison of the test results for two minute flush samples with previous test results for random grab samples from household studies shows similar findings.

The second objective was to estimate the concentration of lead in water as supplied to public schools. We defined this variable as including the lead concentrations in water at the tap closest to the meter (1) after flushing until there was a temperature change in the water, and (2) after flushing for 5 minutes. The lead concentration in water at this site at first draw was not considered a measure of water "as delivered by the water

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
1	24022	A2	SINK	W. SPRINGFIELD	FAUSEY, JOHN	<5	
1	24023	A3	SINK	W. SPRINGFIELD	FAUSEY, JOHN	5.4	
1	24025	B1	BUBBLER	W. SPRINGFIELD	FAUSEY, JOHN	59.5	
1	24026	B2	BUBBLER	W. SPRINGFIELD	FAUSEY, JOHN	<5	
1	24027	C1	SINK	W. SPRINGFIELD	FAUSEY, JOHN	23.5	
1	24028	C2	SINK	W. SPRINGFIELD	FAUSEY, JOHN	<5	
1	24029	D1	COOLER	W. SPRINGFIELD	FAUSEY, JOHN	<5	
1	24030	D2	COOLER	W. SPRINGFIELD	FAUSEY, JOHN	<5	
1	24031	E1	SINK	W. SPRINGFIELD	FAUSEY, JOHN	>75	232.5
1	24032	E2	SINK	W. SPRINGFIELD	FAUSEY, JOHN	12.7	
1	24033	E3	SINK	W. SPRINGFIELD	FAUSEY, JOHN	>75	102.5
2	24099	A1	SINK	GARDNER	ELM STREET	19.1	
2	24100	A2	SINK	GARDNER	ELM STREET	13.1	
2	24101	A3	SINK	GARDNER	ELM STREET	<5	
2	24103	B1	COOLER	GARDNER	ELM STREET	19.6	
2	24104	B2	COOLER	GARDNER	ELM STREET	24.3	
2	24105	C1	SINK	GARDNER	ELM STREET	17.8	
2	24106	C2	SINK	GARDNER	ELM STREET	>75	97.5
2	24107	D1	COOLER	GARDNER	ELM STREET	44.9	
2	24108	D2	COOLER	GARDNER	ELM STREET	10.5	
2	24109	E1	SINK	GARDNER	ELM STREET	31.7	
2	24110	E2	SINK	GARDNER	ELM STREET	<5	
2	24111	E3	SINK	GARDNER	ELM STREET	8.6	
2	24112	A1	SINK	GARDNER	WATERFORD STREET	>75	110
2	24113	A2	SINK	GARDNER	WATERFORD STREET	9.1	
2	24114	A3	SINK	GARDNER	WATERFORD STREET	<5	
2	24116	B1	COOLER	GARDNER	WATERFORD STREET	5.7	
2	24117	B2	COOLER	GARDNER	WATERFORD STREET	5.6	
2	24118	C1	SINK	GARDNER	WATERFORD STREET	>75	90

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
2	24072	E3	SINK	MARLBOROUGH	HILDRETH	<5	
2	24047	A1	FAUCET	TOWNSEND	HAWTHORNE BROOK	>75	150
2	24048	A2	FAUCET	TOWNSEND	HAWTHORNE BROOK	8.0	
2	24049	A3	FAUCET	TOWNSEND	HAWTHORNE BROOK	<5	
2	24051	B1	BUBBLER	TOWNSEND	HAWTHORNE BROOK	11.2	
2	24052	B2	BUBBLER	TOWNSEND	HAWTHORNE BROOK	5.2	
2	24053	C1	SINK	TOWNSEND	HAWTHORNE BROOK	26.3	
2	24054	C2	SINK	TOWNSEND	HAWTHORNE BROOK	18.5	
2	24055	D1	COOLER	TOWNSEND	HAWTHORNE BROOK	32.3	
2	24056	D2	COOLER	TOWNSEND	HAWTHORNE BROOK	>75	430
2	24057	E1	SINK	TOWNSEND	HAWTHORNE BROOK	>75	345
2	24058	E2	SINK	TOWNSEND	HAWTHORNE BROOK	27.8	
2	24059	E3	SINK	TOWNSEND	HAWTHORNE BROOK	16.8	
2	24086	A1	FAUCET	WORCESTER	GRANITE	7.1	
2	24087	A2	FAUCET	WORCESTER	GRANITE	<5	
2	24088	A3	FAUCET	WORCESTER	GRANITE	<5	
2	24090	B1	BUBBLER	WORCESTER	GRANITE	37.3	
2	24091	B2	BUBBLER	WORCESTER	GRANITE	<5	
2	24092	C1	SINK	WORCESTER	GRANITE	61.3	
2	24093	C2	SINK	WORCESTER	GRANITE	7.7	
2	24094	D1	BUBBLER	WORCESTER	GRANITE	50.1	
2	24095	D2	BUBBLER	WORCESTER	GRANITE	<5	
2	24096	E1	SINK	WORCESTER	GRANITE	26.7	
2	24097	E2	SINK	WORCESTER	GRANITE	<5	
2	24098	E3	SINK	WORCESTER	GRANITE	<5	
3	24138	A1	FAUCET	BRIGHTON	HAMILTON, A	31.3	
3	24139	A2	FAUCET	BRIGHTON	HAMILTON, A	5.2	
3	24140	A3	FAUCET	BRIGHTON	HAMILTON, A	<5	
3	24142	B1	SINK	BRIGHTON	HAMILTON, A	>75	886.7

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
3	24135	E1	N/A	DORCHESTER	RUSSELL, WM.	NA	
3	24136	E2	N/A	DORCHESTER	RUSSELL, WM.	NA	
3	24137	E3	N/A	DORCHESTER	RUSSELL, WM.	NA	
3	24151	A1	FAUCET	DORCHESTER	WINTHROP, JOHN	33.1	
3	24152	A2	FAUCET	DORCHESTER	WINTHROP, JOHN	<5	
3	24153	A3	FAUCET	DORCHESTER	WINTHROP, JOHN	<5	
3	24155	B1	SINK	DORCHESTER	WINTHROP, JOHN	>75	105
3	24156	B2	SINK	DORCHESTER	WINTHROP, JOHN	<5	
3	24157	C1	SINK	DORCHESTER	WINTHROP, JOHN	>75	77.5
3	24158	C2	SINK	DORCHESTER	WINTHROP, JOHN	33.7	
3	24159	D1	n/a	DORCHESTER	WINTHROP, JOHN	NA	
3	24160	D2	n/a	DORCHESTER	WINTHROP, JOHN	NA	
3	24161	E1	SINK	DORCHESTER	WINTHROP, JOHN	>75	97.5
3	24162	E2	SINK	DORCHESTER	WINTHROP, JOHN	21.9	
3	24163	E3	SINK	DORCHESTER	WINTHROP, JOHN	5.6	
3	24164	A1	SINK	FRAMINGHAM	JUNIPER HILL	37.6	
3	24165	A2	SINK	FRAMINGHAM	JUNIPER HILL	<5	
3	24166	A3	SINK	FRAMINGHAM	JUNIPER HILL	5.6	
3	24168	B1	BUBBLER	FRAMINGHAM	JUNIPER HILL	<5	
3	24169	B2	BUBBLER	FRAMINGHAM	JUNIPER HILL	48.0	
3	24170	C1	SINK	FRAMINGHAM	JUNIPER HILL	17.8	
3	24171	C2	SINK	FRAMINGHAM	JUNIPER HILL	<5	
3	24172	D1	BUBBLER	FRAMINGHAM	JUNIPER HILL	37.5	
3	24173	D2	BUBBLER	FRAMINGHAM	JUNIPER HILL	13.5	
3	24174	E1	SINK	FRAMINGHAM	JUNIPER HILL	>75	265
3	24175	E2	SINK	FRAMINGHAM	JUNIPER HILL	9.4	
3	24176	E3	SINK	FRAMINGHAM	JUNIPER HILL	8.8	
3	23969	N/A	N/A	GLOUCESTER	WEST PARISH	N/A	
3	23970	N/A	N/A	GLOUCESTER	WEST PARISH	N/A	

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
3	24315	D1	BUBBLER	LAWRENCE	WETHERBEE, EMILY	>75	297.5
3	24316	D2	BUBBLER	LAWRENCE	WETHERBEE, EMILY	8.6	
3	24317	E1	SINK	LAWRENCE	WETHERBEE, EMILY	46.8	
3	24318	E2	SINK	LAWRENCE	WETHERBEE, EMILY	<5	
3	24319	E3	SINK	LAWRENCE	WETHERBEE, EMILY	<5	
3	24190	A1	SINK	LINCOLN	HARTWELL	6.3	
3	24191	A2	SINK	LINCOLN	HARTWELL	11.4	
3	24192	A3	SINK	LINCOLN	HARTWELL	9.3	
3	24194	B1	BUBBLER	LINCOLN	HARTWELL	>75	132.5
3	24195	B2	BUBBLER	LINCOLN	HARTWELL	16.3	
3	24196	C1	SINK	LINCOLN	HARTWELL	68.4	
3	24197	C2	SINK	LINCOLN	HARTWELL	10.4	
3	24198	D1	BUBBLER	LINCOLN	HARTWELL	43.4	
3	24199	D2	BUBBLER	LINCOLN	HARTWELL	7.5	
3	24200	E1	SINK	LINCOLN	HARTWELL	20.6	
3	24201	E2	SINK	LINCOLN	HARTWELL	<5	
3	24202	E3	SINK	LINCOLN	HARTWELL	8.6	
3	24229	A1	SINK	LOWELL	REILLY, PETER	<5	
3	24230	A2	SINK	LOWELL	REILLY, PETER	<5	
3	24231	A3	SINK	LOWELL	REILLY, PETER	<5	
3	24233	B1	BUBBLER	LOWELL	REILLY, PETER	<5	
3	24234	B2	BUBBLER	LOWELL	REILLY, PETER	<5	
3	24235	C1	SINK	LOWELL	REILLY, PETER	5.4	
3	24236	C2	SINK	LOWELL	REILLY, PETER	<5	
3	24237	D1	BUBBLER	LOWELL	REILLY, PETER	<5	
3	24238	D2	BUBBLER	LOWELL	REILLY, PETER	<5	
3	24239	E1	SINK	LOWELL	REILLY, PETER	14.7	
3	24240	E2	SINK	LOWELL	REILLY, PETER	<5	
3	24241	E3	SINK	LOWELL	REILLY, PETER	<5	

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
3	23988	C1	SINK	MARBLEHEAD	COFFIN, L.H.	7.4	
3	23989	C2	SINK	MARBLEHEAD	COFFIN, L.H.	<5	
3	23990	D1	SINK	MARBLEHEAD	COFFIN, L.H.	73.3	
3	23991	D2	SINK	MARBLEHEAD	COFFIN, L.H.	<5	
3	23992	E1	SINK	MARBLEHEAD	COFFIN, L.H.	73.5	
3	23993	E2	SINK	MARBLEHEAD	COFFIN, L.H.	<5	
3	23994	E3	SINK	MARBLEHEAD	COFFIN, L.H.	<5	
3	24177	A1	FAUCET	NATICK	KENNEDY, J.F.	5.2	
3	24178	A2	FAUCET	NATICK	KENNEDY, J.F.	<5	
3	24179	A3	FAUCET	NATICK	KENNEDY, J.F.	<5	
3	24181	B1	BUBBLER	NATICK	KENNEDY, J.F.	5.6	
3	24182	B2	BUBBLER	NATICK	KENNEDY, J.F.	<5	
3	24183	C1	SINK	NATICK	KENNEDY, J.F.	<5	
3	24184	C2	SINK	NATICK	KENNEDY, J.F.	<5	
3	24185	D1	BUBBLER	NATICK	KENNEDY, J.F.	6.5	
3	24186	D2	BUBBLER	NATICK	KENNEDY, J.F.	<5	
3	24187	E1	SINK	NATICK	KENNEDY, J.F.	15.4	
3	24188	E2	SINK	NATICK	KENNEDY, J.F.	5.4	
3	24189	E3	SINK	NATICK	KENNEDY, J.F.	<5	
3	24242	A1	SINK	NEWBURY	NEWBURY ELEM	<5	
3	24243	A2	SINK	NEWBURY	NEWBURY ELEM	<5	
3	24244	A3	SINK	NEWBURY	NEWBURY ELEM	<5	
3	24246	B1	BUBBLER	NEWBURY	NEWBURY ELEM	6.5	
3	24247	B2	BUBBLER	NEWBURY	NEWBURY ELEM	<5	
3	24248	C1	SINK	NEWBURY	NEWBURY ELEM	<5	
3	24249	C2	SINK	NEWBURY	NEWBURY ELEM	<5	
3	24250	D1	BUBBLER	NEWBURY	NEWBURY ELEM	9.5	
3	24251	D2	BUBBLER	NEWBURY	NEWBURY ELEM	<5	
3	24252	E1	SINK	NEWBURY	NEWBURY ELEM	7.0	

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
3	24259	B1	BUBBLER	QUINCY	FURNACE BROOK	48.6	
3	24260	B2	BUBBLER	QUINCY	FURNACE BROOK	7.2	
3	24261	C1	SINK	QUINCY	FURNACE BROOK	11.8	
3	24262	C2	SINK	QUINCY	FURNACE BROOK	7.1	
3	24263	D1	BUBBLER	QUINCY	FURNACE BROOK	>75	237.5
3	24264	D2	BUBBLER	QUINCY	FURNACE BROOK	5.5	
3	24265	E1	SINK	QUINCY	FURNACE BROOK	23.1	
3	24266	E2	SINK	QUINCY	FURNACE BROOK	<5	
3	24267	E3	SINK	QUINCY	FURNACE BROOK	<5	
3	24437	A1	SINK	READING	BARROWS, ALICE	11.6	
3	24438	A2	SINK	READING	BARROWS, ALICE	<5	
3	24439	A3	SINK	READING	BARROWS, ALICE	<5	
3	24441	B1	BUBBLER	READING	BARROWS, ALICE	12.4	
3	24442	B2	BUBBLER	READING	BARROWS, ALICE	<5	
3	24443	C1	SINK	READING	BARROWS, ALICE	>75	87.5
3	24444	C2	SINK	READING	BARROWS, ALICE	6.4	
3	24445	D1	COOLER	READING	BARROWS, ALICE	25.6	
3	24446	D2	COOLER	READING	BARROWS, ALICE	<5	
3	24447	E1	SINK	READING	BARROWS, ALICE	7.0	
3	24448	E2	SINK	READING	BARROWS, ALICE	<5	
3	24449	E3	SINK	READING	BARROWS, ALICE	<5	
3	24450	A1	FAUCET	READING	BIRCH MEADOW	>75	100
3	24451	A2	FAUCET	READING	BIRCH MEADOW	<5	
3	24452	A3	FAUCET	READING	BIRCH MEADOW	<5	
3	24454	B1	BUBBLER	READING	BIRCH MEADOW	26.6	
3	24455	B2	BUBBLER	READING	BIRCH MEADOW	<5	
3	24456	C1	SINK	READING	BIRCH MEADOW	23.5	
3	24457	C2	SINK	READING	BIRCH MEADOW	<5	
3	24458	D1	BUBBLER	READING	BIRCH MEADOW	12.3	

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH							
DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
4	24321	A2	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24322	A3	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24324	B1	BUBBLER	FALL RIVER	WATSON, SAMUEL	>75	55
4	24325	B2	BUBBLER	FALL RIVER	WATSON, SAMUEL	<5	
4	24326	C1	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24327	C2	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24328	D1	BUBBLER	FALL RIVER	WATSON, SAMUEL	5.5	
4	24329	D2	BUBBLER	FALL RIVER	WATSON, SAMUEL	<5	
4	24330	E1	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24331	E2	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24332	E3	SINK	FALL RIVER	WATSON, SAMUEL	<5	
4	24346	A1	FAUCET	FRANKLIN	HORACE MANN	15.1	
4	24347	A2	FAUCET	FRANKLIN	HORACE MANN	<5	
4	24348	A3	FAUCET	FRANKLIN	HORACE MANN	<5	
4	24350	B1	BUBBLER	FRANKLIN	HORACE MANN	6.6	
4	24351	B2	BUBBLER	FRANKLIN	HORACE MANN	<5	
4	24352	C1	SINK	FRANKLIN	HORACE MANN	7.6	
4	24353	C2	SINK	FRANKLIN	HORACE MANN	5.8	
4	24354	D1	BUBBLER	FRANKLIN	HORACE MANN	12.8	
4	24355	D2	BUBBLER	FRANKLIN	HORACE MANN	<5	
4	24356	E1	SINK	FRANKLIN	HORACE MANN	>75	145
4	24357	E2	SINK	FRANKLIN	HORACE MANN	<5	
4	24358	E3	SINK	FRANKLIN	HORACE MANN	<5	
4	24333	A1	SINK	NEW BEDFORD	SWIFT, JIREH	45.8	
4	24334	A2	SINK	NEW BEDFORD	SWIFT, JIREH	11.9	
4	24335	A3	SINK	NEW BEDFORD	SWIFT, JIREH	<5	
4	24337	B1	BUBBLER	NEW BEDFORD	SWIFT, JIREH	10.7	
4	24338	B2	BUBBLER	NEW BEDFORD	SWIFT, JIREH	8.4	
4	24339	C1	SINK	NEW BEDFORD	SWIFT, JIREH	<5	

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

DEQE NO.	LAB NO.	SITE	SAMPLE	CITY/TOWN	SCHOOL NAME	LEAD CONC. (µg/L)	
						LAB RESULT	RETEST
4	24371	E3	SINK	STOUGHTON	NORTH ELEM	<5	
4	24372	A1	SINK	W. YARMOUTH	MATTACHEESE	15.4	
4	24373	A2	SINK	W. YARMOUTH	MATTACHEESE	<5	
4	24374	A3	SINK	W. YARMOUTH	MATTACHEESE	<5	
4	24376	B1	COOLER	W. YARMOUTH	MATTACHEESE	<5	
4	24377	B2	COOLER	W. YARMOUTH	MATTACHEESE	<5	
4	24378	C1	SINK	W. YARMOUTH	MATTACHEESE	6.1	
4	24379	C2	SINK	W. YARMOUTH	MATTACHEESE	<5	
4	24380	D1	COOLER	W. YARMOUTH	MATTACHEESE	5.4	
4	24381	D2	COOLER	W. YARMOUTH	MATTACHEESE	9.5	
4	24382	E1	SINK	W. YARMOUTH	MATTACHEESE	19.0	
4	24383	E2	SINK	W. YARMOUTH	MATTACHEESE	<5	
4	24384	E3	SINK	W. YARMOUTH	MATTACHEESE	<5	